# ENVIRONMENTAL IMPACT ASSESSMENT OF THE MUNICIPALITY OF ZLATOGRAD LANDFILL

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# ENVIRONMENTAL IMPACT ASSESSMENT OF THE MUNICIPALITY OF ZLATOGRAD LANDFILL

## INTRODUCTION

This report discusses the environmental impact assessment (EIA) of the existing land fill for municipal solid waste (MSW) in the municipality of Zlatograd, analyzes its methods of operation, and draws a conclusion regarding environmental protection (EP) of the following components: air, water, soil, noise, harmful emissions, landscape, population, and human settlement area, in compliance with the existing legal requirements and in consideration of its environmental, social and economic advisability.

The report was developed on the basis of Regulation No. 1, concerning EIA, published in the State Gazette No. 7/1995 and in accordance with the requirements of the legislative documents and acts existing and operating at that time. The data and survey results exhibited in this document were collected by the team and its leader during their site visits to the land fill and the surrounding area. This report was prepared by a team of licensed experts led by assistant professor Emilia Kostakeva, license No. 25/25.04.1996, issued by the Ministry of Environment, with sphere of competence: water and wastes.

The members of the team are:

- Associate professor, engineer, chemist Dr. Magdelinka Zlatkova Radenkova-Ianeva, holder of license No. 15/25.04.1996, issued by the Ministry of Environment (MOE).
- Forestry engineer, Anna Naneva Peeva, license No. 30/25.04.1996, issued by the MOE.
- Dr. Peter Georgiev Petrov, senior research associate second degree, engineer, license No. 12/25.04.1996, issued by MOE.

In the course of preparation of the EIA, EKOEM held consultations with the following individuals:

- Dimitar Toshev, associate professor, D. Sc., engineer lecturer at UASG, expert in stability of soil embankments and underground water filtration.
- Margarita Nikolova, senior research associate second degree, D. Sc., agronomist, expert in soil and agrotechnics.
- Momchil Vassilev, associate professor, D. Sc., engineer, expert in landslides, land improvement and soil.

The statements of the licensed experts are provided as Attachment 3.

## GENERAL INFORMATION

### *Contact Information*

*Contact persons:*

*Municipality of Zlatograd*
*Mayor Nikolai Despotov - tel. 03071/2551; fax: 03071/4023*
*Minka Kehaiova - Technical Director, Sanitation tel. 03071/2413 (ext. 34)*

***Site Management and Population Served***

The site is municipal property and is operated by the municipality of Zlatograd. The land fill now in use was opened in 1972. It is used for waste disposal not only from the city of Zlatograd but also from the nearby villages with a total population of about 15,000. Only about 750 people, living in the most remote parts of this area, do not dispose their waste in the land fill.

The transportation of the waste is organized by the municipality and is done by means of three specialized vehicles, two trucks which are compatible with the "Meva" type of bins, a Skoda-Beaver 02-49 (Picture 1) and a GAZ 53MA vehicle (Picture 2), and one bulk container vehicle for the replaceable containers (Picture 3).

***Total Area of the Site***

The wastes transportation route ends on a side road off to the right of the main road from Zlatograd to Kardjali. The total area of the land fill is about 5-6 decares.

In its north-eastern corner, the land fill is surrounded by agricultural fields (Pictures 4 and 5). It is possible that people and animals can approach the land fill from the river and the river bank (Figure 2). Hence, the possibility of animals feeding off the green vegetation in the immediate proximity of the land fill (Picture 6).

***Sketch Map and Description of the Area under the Impact of the Site***

Figure 1 shows the position of the land fill relative to the city of Zlatograd, and Figure 2 shows a sketch map (not to scale) of the land fill itself. The same figure shows the water sampling points from the river Varbitza, located before and after the land fill, and the location of the 3 test pits for the soil tests. Test pit No. 2 is just next to the base of the land fill (Picture 6), and test pit No. 3 is in the neighboring private property (Picture 6).

### *Location*

The existing municipal solid waste land fill in Zlatograd is situated between the main road between Zlatograd and Kardjali and the northern bank of the Varbitza river. The waste is piled up on the left high terrace of the river bank, in close proximity to Zlatograd, about 6.5 kilometers from the city. It occupies a protruding part of the river bank. The river stream flows straight towards the land fill front (Figures 1 and 2).

Downstream, about 2.5 - 3.0 kilometers from the land fill, on the left bank terrace, there are water supplying shaft wells. A pumping station sends the water into the water supply system of the city. The same terrace has a shaft well for the water supply of the village of Dollen.

Zlatograd's main waste water collecting pipe flows into the industrial zone. The exact point where it flows in is 1.9 kilometers preceding the city and some 3.4 kilometers up after the land fill. Figure 1 shows the above mentioned points. It also shows a view of the area after Zlatograd.

The MSW land fill of Zlatograd is situated primarily on a terrain falling within the land fund of the municipality—the terrace of the Varbitza river. A small part of the occupied area—the slope just next to the road, had been part of the forest fund and was later transferred to the land fill.

Local Government Initiative (LGI) advisor James Dohrman made several visits to the land fill accompanied by other licensed Bulgarian experts. The team discovered that the land fill is situated on the upper terrace, which is uninhabited and does not get overflown by the river. The terrace is surrounded by a dry stone wall and is 1.0 - 1.5 meters above the lower terrace. Its elevation is about 1.0 meters above the level of the river (July - August 1996). There is a considerable amount of plastic, paper and fabric wastes hanging from the trees and bushes on the lower terrace, suggesting that in the case of high water part of the wastes will be swept away by the river stream. Since there are no bushes and trees on the upper terrace, it cannot be judged what the level of deluge by high water will be, but the huge catchment basin of the river and the intensive rainfall characteristic of the region are a prerequisite, showing the possibility of violent floods endangering the land fill base, in spite of the fact that its upper part is filled with construction wastes scattered all around, loosely compacted and stratified. One can notice trashed steel containers in the lower land fill part, very close to the river, stored there with the purpose of serving as a waste stoppage.

## CHARACTERISTICS OF THE SITE

### *Brief Overview of the Main Technological Processes*

The existing MSW land fill in the municipality of Zlatograd has been in use since 1972. The wastes are unloaded from a considerable height. This has caused their stratification. A section of the waste (the larger pieces) can be found close to the very bank of the river. With the advancement of the emptying front, they have reached the extension of the terrace and can be found on both terraces (Pictures 6 and 7). During our several visits and inspections of the land fill base, we discovered the presence of bare rocks mainly where the waste pile begins and where the river bed is the narrowest (Picture 7). There are certain sections of the river where the river bed is a bare rock. This is typical for the Varbitza river. One such place is the terrain called "Vanichkite", the bathtubs, located above Zlatograd, which is used by the population as a place for recreation and swimming. It is suggested that the base over which the piling started is one and same.

No waste compacting is done at the land fill. The management mainly relies on natural compacting and on the fact that the wastes are always burning (Pictures 8 and 9), which reduces volume and compacts automatically.

Except for the three specialized vehicles for waste transportation owned by the municipality, we have also observed other vehicles dumping wastes (both private and company owned) (Picture 9). This is mainly done during the weekend, when the municipal vehicles do not transport wastes and when there is no guard at the land fill. Anybody can dump wastes of all kinds without any control. During many visits to the land fill, the team leader has also observed the disposal of textile materials, saw-dust, construction wastes, damaged road covers, earth, etc. These could be used for re-cultivation purposes or as an intermediate insulation layer. After such chaotic and illegal dumping, the municipality needs to hire a bulldozer and an excavator to dispose of the wastes and make room for the vehicles which collect and transport MSW by the municipality, since the wastes mentioned above are not always emptied in the most suitable places on the land fill. There are cases of construction wastes disposal quite near to the entrance or on the unloading platform. They need to be pushed to the edge of the slope by an excavator to leave space for the waste-collecting machines which unload moving backwards.

This method of operating the land fill has led to the formation of a high and steep slope. The height is about 10-15 meters, and the slanting line falls from 40 to 60 degrees (Picture 10). In the north-eastern part of the land fill there is a carcass pit for dead animals (Picture 11). Certain members of the team visited the land fill in March 1996, the fence was torn down and dogs could enter. By early 1997, the team found that the fence had been restored and the pit was properly covered with construction panels (Picture 11). The land fill has been operated without a preliminary plan.

During all these 24 years, nothing has been done to cover the wastes, in order to prevent the free access of birds and animals to it, and to enhance a quicker methane decomposition of organic substances in the wastes.

Figure 3 shows schematically (not to scale) a cross-section of the land fill, based on visual observations and presumptions about the geologic base and same approximate measurements, taken by Mrs. Kostakeva and Mr. James Dohrman during their visit to the land fill under previous work. The land fill is built as a slope-bank land fill. It is situated on the upper left terrace of the river Varbitza, just beyond Zlatograd. It has been developed on an area between the main road to the city and the river. It occupies a protruding bank of the river. The river stream is directed towards the front-line of the land fill. This can cause direct attack of a high water at the foot of this angle of repose, and the flood can partially dig out the earth and wash away the wastes. This part of the land fill holds mainly construction wastes, which are loosely dumped and poorly compacted. It must be noted that these construction wastes are highly subject to erosion by the river stream.

The land fill widens in its central part. Topographic conditions have allowed the creation of an angle of repose, consisting of compacted MSW higher than 10 meters. In practice, the wastes are unloaded in the upper part of the land fill near the main road and afterwards pushed away with a bulldozer towards the river, where a slope has been formed which continues to change its height, 45 - 60 steep. These are very steep slopes and can lose their stability quite easily in case of an earthquake or an overflow during long rainfalls. However, it is good that the slope is reinforced with textile, plastic and metal wastes, which increase its strength and make the angle more solid. In addition, the constant burning of the land fill has compacted the solid wastes.

The land fill is built directly on the natural terrain above the rocky soil under the slope, which in the upper terrace of the river is covered with a sandy-clay soil, a result of the withering processes on the left bank and the processes shaping the riverbed. The geologic base is firm. There is no possibility of sliding along the contact surface between the wastes and the terrain.

The land fill in the municipality of Zlatograd is not a production site. Thus, issues such as resource recovery, energy sources, sources of water supply, production output, conditions of warehouses and energy efficiency are not discussed in the EIA report.

## OVERVIEW OF ENVIRONMENTAL MANAGEMENT

The existing land fill of Zlatograd has been used for 24 years. The existing approach road and the fence to some extent restrict the spreading of the wastes outside the area assigned for the land fill. The legislative requirements for environmental protection deal with air, underground and surface waters. The land fill has been burning for almost the entire period of its exploitation. Gas and smoke have been emitted into the air. There is no control over these emissions. During initial and subsequent visits, the team noted an explosion of pressurized spray containers which had been dumped together with other MSW and were burning. When they explode, they go up very high in the air and there is a real danger that people in the nearby properties, land fill employees, or those who go there to look for recyclable materials could become injured. The explosions of the containers are very loud, sounding like gun shots. While the land fill is operated in this way, the burning (sometimes with excessively high flames) and the explosions cannot be prevented.

The constant burning of the wastes creates conditions for evaporation of wastewater, which has fallen. In this way the quantity of waste waters would be less than with land fills without burning. Results from the water testing shows that during the summer months, there is no leachate flowing out of the land fill base. There is no control, however, over whether any leachate forms in the land fill or not. There is a need for monitoring, since no information is available on whether the land fill is insulated from the environment. That is why, even if a little leachate appeared, it would get into the underground water horizons and from there it would contaminate the river.

Environmental capital improvements have been connected with maintaining the land fill in operation. A fence has been built to restrict the uncontrolled disposal and spreading of the wastes and the access of people to the land fill.

There is no information about any permits, licenses or EIA decisions. No fees, fines, or other payments have been collected, related to environmental protection. The annual expenditures for the protection of the environment basically amount to paying the staff to control the unloading of wastes and the maintenance of the dead animals pit. There is no information about complaints about and signals for pollution caused by the land fill operation.

The land fill is situated outside the urban area and only its staff is exposed to its harmful effect, including those who transport and unload the wastes. The latter are in contact with the polluted air for a very short period of time and their health condition is not influenced significantly by the conditions at the site. The guard, and the agricultural workers who cultivate the neighboring cornfields are in the area of the land fill for a longer period of time. There is no information about damages or incidents. However, bursts of fire are possible while there is a continuous burning at the land fill.

## CHARACTERISTICS OF POLLUTANTS AND ENVIRONMENTAL IMPACT ASSESSMENT OF THE SITE

### *Ambient Air*

**Status of Ambient Air: Climatic and Meteorological Factors**

The region falls into the Continental-Mediterranean climatic area, South-Bulgarian climatic sub-area, east-Rhodopian low-mountainous climatic zone. According to the information obtained from the Zlatograd meteorological station, annual average temperature of the air is 10.8° C with a maximum temperature in July of 20.6° C and a minimum temperature in January of 0.8° C, which means that the summer is temperately warm and the winter is comparatively mild. The peak values of the annual average maximum and minimum temperatures are 17.1° C and 4.9° C, respectively, with a monthly average maximum temperature in August (28.9° C), and a monthly average minimum temperature in January (- 3.9° C).

The annual average relative humidity of the air is 75 percent, with a maximum in November (85 percent). There are 13.0 days with relative air humidity of 30 percent or less, and 62.4 days with 80 percent or more. This provides for good vegetative conditions of the forest and grass vegetation in the area. The annual precipitation amount for the climatic area of the land fill is 650 millimeters in average, which is considerably lower than the actual total for the Zlatograd area. According to the data from the Zlatograd station, it is 78 millimeters, while the monthly average maximum in November and December is 43 millimeters, and the minimum in August is 18 millimeters. Intensive precipitation of varying duration is characteristic for the Zlatograd area. In occurs most often in the fall, and in combination with the large water-collecting basin of the Varbitza river, it becomes the pre-condition for violent rising tides on the river, which endanger the stability of the MSW depot. The maximum precipitation amounts (in millimeters) from April to October vary from 10.0 over 5 minutes to 46.3 in 60 minutes, and 59.7 over more than 60 minutes. The average duration of the snow cover is 90 days.

The average monthly wind velocity is between 0.9 meters per second (in June) and 1.2 meters per second (in February, March, April and July). The average annual wind velocity is 1.1 meters per second. There is no data available about the rose of the winds for the Zlatograd station. Detailed meteorological data is given in Tables 1 to 4.

**Table 1**
**Climatic Information for the Zlatograd Area**

| | J | F | M | A | M | J | J | A | S | O | N | D | A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | e | a | p | a | u | u | u | e | c | o | e | n |
| | n | b | r | r | y | n | l | g | p | t | v | c | n |
| | | | | | | | | | | | | | u |
| | | | | | | | | | | | | | a |
| | | | | | | | | | | | | | l |
| Average monthly and annual relative air humidity (in percent) | 8 | 8 | 7 | 7 | 7 | 7 | 6 | 6 | 7 | 8 | 8 | 7 | 7 |
| | 3 | 0 | 8 | 3 | 3 | 3 | 6 | 4 | 9 | 8 | 5 | 3 | 5 |
| Air humidity (average monthly and annual water evaporation rates) | 5 | 6 | 7 | 8 | 1 | 1 | 1 | 1 | 1 | 9 | 6 | 1 | |
| | . | . | . | . | 2 | 5 | 6 | 5 | 3 | 0 | . | . | 0 |
| | 9 | 2 | 2 | 9 | . | . | . | . | . | 0 | 9 | . | |
| | | | | | 7 | 5 | 4 | 5 | 3 | 9 | | | 7 |
| Number of foggy days | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | |
| | . | . | . | . | . | . | . | | . | . | . | 1 | |
| | 8 | 5 | 5 | 8 | 4 | 1 | | | 2 | 2 | 7 | 1 | . |
| | | | | | | | | | | | | | 5 |
| Average monthly and annual wind velocity (in meters per second) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 1 | 2 | 2 | 2 | 2 | 1 | 9 | 2 | 0 | 0 | 1 | 1 | |
| Air temperature peaks | 5 | 7 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 7 |
| | . | 0 | 6 | 1 | 5 | . | . | 8 | 8 | 4 | 8 | 2 | . |
| | 1 | 0 | . | . | . | . | . | . | . | . | . | 4 | . |
| | | | 4 | 4 | 4 | 3 | 3 | 3 | 9 | 5 | 3 | 6 | |
| Average monthly and annual air temperature maximums | - | - | - | 4 | 8 | 1 | 1 | 1 | 1 | 9 | 5 | 2 | - |
| | 3 | 2 | 0 | . | . | 1 | 3 | 2 | . | . | . | . | 1 |

**Table 2**
**Maximum 24-Hour Precipitation (millimeters, month, year)**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120 | 216 | 92 | 63 | 83 | 72 | 80 | 45 | 120 | 234 | 105 | 104 | 234 |
| 1978 | 1963 | 1971 | 1937 | 1963 | 1960 | 1937 | 1951 | 1957 | 1970 | 1961 | 1982 | 1970 |

**Table 3**
**Average 10-Day Thickness of the Snow Cover (in centimeters)**

| December | | | January | | | February | | |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| - | - | 4 | 5 | 6 | 7 | 4 | - | - |

Note: Average duration of the snow cover is 90 days.

**Table 4**
**Maximum Precipitation Amounts (millimeters) of Different Duration (April-October)**

| Minutes | 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | >60 |
|---|---|---|---|---|---|---|---|---|---|---|
| Millimeters | 10.0 | 18.5 | 25.6 | 29.0 | 32.6 | 35.9 | 40.3 | 42.5 | 46.3 | 59.7 |

### Sources of Atmospheric Pollution

MSW disposal is accompanied by a process of SW decomposition which lasts over a long period of time. Depending on the conditions, the process of mineralization of organic MSW components undergoes an aerobic and an anaerobic phase. The main products of the decomposition of the wastes are water, carbonic dioxide and methane.

The land fill in Zlatograd Municipality has certain distinctive features which affect the processes of decomposition and pollution. First, it burns constantly. Because of this, the main air pollutants are carbonic dioxide and carbonic oxide, which are formed by the incomplete burning of the wastes. The biological decomposition is slowed down in certain periods of time (especially in the summer months) because of the low humidity of the wastes caused by burning. Because of this, the production of methane and carbonic dioxide is not expected in great amounts as a result of the biological process of decomposition of the wastes. What is more, the small amount of methane which could be produced would burn out, given the manner of operating the land fill.

There are mostly random gas emissions from the land fill, such as methane, carbonic dioxide and carbonic oxide. The operating conditions at the site do not allow for any reduction of the emissions and collection of gases. The constant burning at the land fill produces smell and dust. The spread of these two elements does not affect a large area due to the restricted daily amount of the wastes and on the location of the land fill. There are no treatment plants on the site to prevent air pollution, and there are no installations to control and monitor this pollution. Carbonic oxide and carbonic dioxide are produced when the wastes burn. Carbonic oxide is very toxic and affects the hemoglobin in both people and animals. When polyvinyl-chloride wastes burn, they produce toxic gases such as chlorine-hydrogen and dioxins. Hazardous gases can be produced by the incomplete burning of fabrics, wood and food wastes. Burning can also generate conditions for the spreading of some residues; for example, some heavy metals were found in the smoke, mixed in with the ashes and thus carried into the ambient air.

Therefore, the existing land fill is a potential pollutant and a health hazard.

## *Waters*

### Status of Surface and Underground Waters

All atmospheric waters penetrate into the land fill as there are no protective ditches which could channel some of the precipitation water away from the waste disposal area. Atmospheric waters soak through the waste layers and thus help increase the leachate produced by the decomposition of the wastes. At the same time, certain quantities of atmospheric waters flow down the steep slopes of the land fill and add to the pollution of surface waters and thus of the river waters.

### Pollution Sources

Leachate is produced in every land fill. It is the result of the process of biological decomposition of municipal solid wastes and its volume is increased by the surface waters infiltrating the land fill.

The existing land fill in Zlatograd has two characteristic features which distinguish it from similar land fills in the country:

— The wastes disposed in it have less organic components; and
— The land fill burns constantly.

These features of the land fill influence the quantity and composition of the leachate it generates. Because of the constant burning, the organic wastes have no possibility to decompose; they burn out, which is accompanied by the emission of hydrogen oxides and some toxic gases produced by the burning of plastic wastes. Most of the organic wastes turn into ashes and cinders, which are inert, insoluble and presumably of alkaline character. This is also of great importance, because in alkaline environments (pH > 7), the heavy metals which can be found in the wastes are not very soluble or do not dissolve.

The constant burning contributes to the evaporation of some amount of atmospheric water, which falls onto the land fill. This has an overall favorable effect on the environment, because burning decreases the total volume of the water infiltrated into the body of the land fill, and reduces the volume of leachate from the land fill. At the same time, the high temperature resulting from the burning reduces the total humidity at the land fill. It is known that biological decomposition requires humidity of at least 40 percent. The intensity of the biological processes is considerably reduced by a humidity between 20 and 40 percent, and with a humidity under 20 percent, the decomposition stops. Hence, it is worth noting that the Zlatograd land fill should not be expected to produce any considerable quantity of leachate.

The inspection of the land fill base did not reveal any points of leachate flowing out, of the characteristic yellow-brown color. The soil in the base does not show any changes in its basic color. If any leachate, with the composition and color typical for land fills, had been produced during intensive precipitation, there should have been visible places where the waters have been filtered and where the soil would have had a darker color.

In order to check the potential for leachate flow from the land fill into the river Varbitza, test pit No. 1 (0.7 meters deep) was dug out in immediate proximity to the river bank. No leachate escaping the land fill was observed. No filtering of leachate through the soil in the proximity of test pit No. 1 was found, and there were no unusual smells. Because of the specific character of the assessed site, and the absence of treatment plants, the issue of plant effectiveness and operation is not considered, no recommendations can be made regarding any sludge resulting from such an operation.

**Environmental and Health Impact Assessment of Water Pollution**

The Varbitza river flows in immediate proximity to the land fill in Zlatograd Municipality. The land fill itself is situated close to a big bend on the river. The facts that this natural water stream is close to the land fill and that the land fill itself is situated 2.7 kilometers above the city's water supply wells require special attention. It is necessary to carry out a river pollution test to make sure no leachate from the land fill escapes into the stream. For this purpose, samples of river water were taken from the point after the sewerage pipe junctures into the river over and under the land fill. The data from the tests are summarized in the following three Tables No. 187, No. 188 and No. 189.

**Record 187**
**Analysis**

| | | | Category Standards | | |
|---|---|---|---|---|---|
| No. | Indexes | Result (mg/dm) | II | III | GK |
| 1 | Temperature (°C) | 22 | - | - | - |
| 2 | Color degrees | no | - | - | - |
| 3 | Smell, points | no | 3 | 3 | - |
| 4 | Act. reaction, pH | 7.9 | 6 - 8.5 | 6 - 9 | 6.5 - 9 |
| 5 | Dissolved $O_2$ | 7.4 | 4 | 2 | - |
| 6 | Saturation with 0.2 percent | 89 | 40 | 20 | - |
| 7 | El. conductance mkSI/cm | 915 | 1300 | 1600 | - |
| 8 | BOD -5 | 2.1 | 15 | 25 | - |
| 9 | Oxidation | 2.7 | 30 | 40 | - |
| 10 | COD (bi-chromate) | 40 | 70 | 100 | - |
| 11 | Dissolved substances | 703 | 1000 | 1500 | - |
| 12 | Insoluble substances | 6 | 50 | 100 | 500 |
| 13 | Chloric ions | | 300 | 400 | - |
| 14 | Sulphate ions | | 300 | 400 | - |
| 15 | Nitrogen (ammonia) | 0.68 | 2 | 5 | - |
| 16 | Nitrogen (nitrite) | 0.15 | 0.04 | 0.06 | - |
| 17 | Nitrogen (nitrate) | 2.00 | 10 | 20 | - |
| 18 | Phosphates ($PO_4$) | | 1 | 2 | - |
| 19 | Hydrogen sulphide | | no | 0.1 | 0.1 |
| 20 | Cyanides | 0.0 | 0.05 | 0.1 | 0.5 |
| 21 | Phenols (volatile) | | 0.05 | 0.1 | - |
| 22 | Oil products | 0.0 | 0.3 | 0.5 | 50 |
| 23 | Detergents | | 1 | 3 | 50 |
| 24 | Iron (general) | 0.055 | 1.5 | 5 | 10 |
| 25 | Manganese (general) | 0.025 | 0.3 | 0.8 | - |
| 26 | Cadmium | 0.002 | 0.01 | 0.02 | 1 |
| 27 | Tin | < 0.01 | 0.05 | 0.2 | 1 |
| 28 | Arsenic | | 0.05 | 0.2 | 0.5 |
| 29 | Copper | < 0.01 | 0.1 | 0.5 | 0.8 |
| 30 | Chrome (III) | | 0.5 | 1 | 2.7 |
| 31 | Chrome (VI) | | 0.05 | 0.1 | 0.5 |
| 32 | Nickel | | 0.2 | 0.5 | 1 |
| 33 | Zinc | 0.266 | 5 | 10 | 10 |
| 34 | Fats | 2 | 3 | - | - |

Conclusion: The sample does not meet the requirements for category II (State Gazette (SG) No. 96, December 12, 1986) under indicator No. 16.
1/Test accomplished by: signed, Irina Gogusheva
2/Test accomplished by: signed, J. Tolusheva

Manager, accredited test laboratory: signed, I. Koubinski

**Record 188**
**Analysis**

| | | | Category Standards | | |
|---|---|---|---|---|---|
| No. | Indicator | Result (mg/dm) | II | III | GK |
| 1 | Temperature (°C) | 22.3 | - | - | - |
| 2 | Color degrees | no | - | - | - |
| 3 | Smell, points | no | 3 | 3 | - |
| 4 | Act. reaction, pH | 7.9 | 6 - 8.5 | 6 - 9 | 6.5 - 9 |
| 5 | Dissolved $O_2$ | 8.9 | 4 | 2 | - |
| 6 | Saturation with 0.2 percent | 86 | 40 | 20 | - |
| 7 | El. conductance mkSI/cm | 919 | 1300 | 1600 | - |
| 8 | BOD -5 | 2.9 | 15 | 25 | - |
| 9 | Oxidation | 2.6 | 30 | 40 | - |
| 10 | COD (bi-chromate) | 14 | 70 | 100 | - |
| 11 | Dissolved substances | 731 | 1000 | 1500 | - |
| 12 | Insoluble substances | 14 | 50 | 100 | 500 |
| 13 | Chloric ions | | 300 | 400 | - |
| 14 | Sulphate ions | | 300 | 400 | - |
| 15 | Nitrogen (ammonia) | 0.61 | 2 | 5 | - |
| 16 | Nitrogen (nitrite) | 0.06 | 0.04 | 0.06 | - |
| 17 | Nitrogen (nitrate) | 0.94 | 10 | 20 | - |
| 18 | Phosphates ($PO_4$) | | 1 | 2 | - |
| 19 | Hydrogen sulphide | | no | 0.1 | 0.1 |
| 20 | Cyanides | 0.0 | 0.05 | 0.1 | 0.5 |
| 21 | Phenols (volatile) | | 0.05 | 0.1 | - |
| 22 | Oil products | 0.0 | 0.3 | 0.5 | 50 |
| 23 | Detergents | | 1 | 3 | 50 |
| 24 | Iron (general) | 0.067 | 1.5 | 5 | 10 |
| 25 | Manganese (general) | 0.017 | 0.3 | 0.8 | - |
| 26 | Cadmium | < 0.001 | 0.01 | 0.02 | 1 |
| 27 | Tin | < 0.01 | 0.05 | 0.2 | 1 |
| 28 | Arsenic | | 0.05 | 0.2 | 0.5 |
| 29 | Copper | < 0.01 | 0.1 | 0.5 | 0.8 |
| 30 | Chrome (III) | | 0.5 | 1 | 2.7 |
| 31 | Chrome (VI) | | 0.05 | 0.1 | 0.5 |
| 32 | Nickel | | 0.2 | 0.5 | 1 |
| 33 | Zinc | 0.088 | 5 | 10 | 10 |
| 34 | Fats | 3 | 3 | - | - |

Conclusion: The sample does not meet the requirements for category II (State Gazette (SG) No. 96, December 12, 1986) under indicator No. 16.
1/Test accomplished by: signed, Irina Gogusheva
2/Test accomplished by: signed, J. Tolusheva

Manager, accredited test laboratory: signed, I. Koubinski

**Record 189**
**Analysis**

| | | | Category Standards | | |
|---|---|---|---|---|---|
| No. | Indicator | Result (mg/dm) | II | III | GK |
| 1 | Temperature (°C) | 22.3 | - | - | - |
| 2 | Color degrees | no | - | - | - |
| 3 | Smell, points | no | 3 | 3 | - |
| 4 | Act. reaction, pH | 7.5 | 6 - 8.5 | 6 - 9 | 6.5 - 9 |
| 5 | Dissolved $O_2$ | 5.2 | 4 | 2 | - |
| 6 | Saturation with 0.2 percent | 63 | 40 | 20 | - |
| 7 | El. conductance mkSI/cm | 944 | 1300 | 1600 | - |
| 8 | BOD -5 | 6.6 | 15 | 25 | - |
| 9 | Oxidation | 6.8 | 30 | 40 | - |
| 10 | COD (bi-chromate) | 35 | 70 | 100 | - |
| 11 | Dissolved substances | 727 | 1000 | 1500 | - |
| 12 | Insoluble substances | 9 | 50 | 100 | 500 |
| 13 | Chloric ions | | 300 | 400 | - |
| 14 | Sulphate ions | | 300 | 400 | - |
| 15 | Nitrogen (ammonia) | 3.95 | 2 | 5 | - |
| 16 | Nitrogen (nitrite) | 0.21 | 0.04 | 0.06 | - |
| 17 | Nitrogen (nitrate) | 0.78 | 10 | 20 | - |
| 18 | Phosphates ($PO_4$) | | 1 | 2 | - |
| 19 | Hydrogen sulphide | | no | 0.1 | 0.1 |
| 20 | Cyanides | 0.0 | 0.05 | 0.1 | 0.5 |
| 21 | Phenols (volatile) | | 0.05 | 0.1 | - |
| 22 | Oil products | 0.0 | 0.3 | 0.5 | 50 |
| 23 | Detergents | | 1 | 3 | 50 |
| 24 | Iron (general) | 0.065 | 1.5 | 5 | 10 |
| 25 | Manganese (general) | 0.023 | 0.3 | 0.8 | - |
| 26 | Cadmium | 0.007 | 0.01 | 0.02 | 1 |
| 27 | Tin | 0.01 | 0.05 | 0.2 | 1 |
| 28 | Arsenic | | 0.05 | 0.2 | 0.5 |
| 29 | Copper | < 0.01 | 0.1 | 0.5 | 0.8 |
| 30 | Chrome (III) | | 0.5 | 1 | 2.7 |
| 31 | Chrome (VI) | | 0.05 | 0.1 | 0.5 |
| 32 | Nickel | | 0.2 | 0.5 | 1 |
| 33 | Zinc | 0.106 | 5 | 10 | 10 |
| 34 | Fats | 5 | 3 | - | - |

Conclusion: The sample does not meet the requirements for category II (State Gazette (SG) No. 96, December 12, 1986) under indicators No. 15, 16, 34.
1/Test accomplished by: signed, Irina Gogusheva
2/Test accomplished by: signed, J. Tolusheva

Manager, accredited test laboratory: signed, I. Koubinski

■ **Water Testing Analysis.** These tests showed that some indicators of the water samples taken downstream from the land fill have worse values (record No. 187) than water samples taken upstream from the land fill (record No. 188). For example, the amount of the dissolved oxygen is lower, chemical oxygen demand (COD) (bi-chromate oxidation) is considerably increased, there is an increased content of all forms of nitrogen in the water, and the quantities of manganese, cadmium and zinc are increased in comparison with the sample taken before the land fill. These indicators show in the most unambiguous manner that pollution of the Varbitza river occurs after the land fill. It is natural to assume that the cause of this is the leachate from the land fill, although it was not ascertained during the field examination.

This conclusion sounds logical against the background of the comparative analysis of the test results of water samples taken after the land fill and of river water samples taken after the main waste water collector which flow out into the Varbitza river (record No. 188). Both samples have close values for COD, dissolved oxygen, manganese and zinc. This suggests that the pollution of the Varbitza river which can be observed after the land fill has the same character as the pollution caused by the inflow of waste waters from the main sewerage collector of Zlatograd into the river.

The analysis data from the Varbitza river sample taken after the land fill (record No. 187) show low values for biochemical oxygen demand ($BOD_{5)}$ and higher values for COD than in water test samples taken before the land fill (record No. 188). These results show that the river water contains, first of all, easily oxidizing reducers, while reducers which are subject to biochemical decomposition are present in less amounts. The similar result conforms with the circumstance that the wastes in the land fill do not reach biochemical decomposition—they burn out, producing inorganic oxides and salts (basically carbonates).

The results of the performed tests of water samples show that the water in the Varbitza river is polluted by the land fill of Zlatograd located on the slope of the river bank. This will undoubtedly affect the qualities of drinking water which is pumped out of the water supply wells into the city's drinking water supply grid. This poses health hazards conditions for the community. The effect of the Varbitza river pollution on the qualities of the drinking water in Zlatograd will be reduced by self-cleaning of the water down the river flow and its filtration through sand and gravel layers before it is pumped out into the water supply grid.

### *Wastes*

The land fill of Zlatograd Municipality, as a subject of this EIA, is not an industrial enterprise and no wastes are produced as a result of its operation.

### *Toxic and Other Hazardous Substances*

In addition to MSW, hospital wastes are also dumped at the land fill of Zlatograd. They are not specially treated before disposal. This creates hazards for the people who collect and transport the wastes as well as for the staff who services the land fill. They can come into contact with infected material, with further consequences such as illness and the possibility of spreading the infection. The inspection also found that car batteries were also disposed of at the land fill, which can lead to harmful consequences (Picture 12).

Since the land fill is operated without keeping any log of deposited wastes other than MSW, their type and exact location of deposition, there is a real danger that other dangerous wastes may have been dumped during the last 24 years . The presence of these wastes is not predictable and we can only estimate what the consequences of their presence could be. Supporting the idea that other dangerous wastes have been dumped at the landfill is the fact that during all site visits, the EIA manager observed the disposal of wastes from the local light industry in the land fill, such as saw dust, rags, threads, tires, and construction wastes.

The presence of the carcass pit (Picture 11) is also a real danger when it is not safely covered with panels, or when it is opened and there is a free access into it for stray dogs and wild animals (foxes, etc.). Such an incident occurred on March 13, 1996. After that, measures were taken and the dead animals pit was properly closed.

### *Harmful Physical Factors*

The waste disposal vehicles are a noise pollutant at the land fill. The process of waste compaction would worsen the noise pollution if it was introduced. The noise generated at the land fill has harmful effects only on the staff working there. They are also affected by the noise from the main road to Zlatograd, with the intensity of the traffic producing a higher noise level than that coming from the land fill itself. Explosions of discarded pressurized containers are occasionally an additional noise pollution factor, since the contents of the wastes depend on where in the municipality they originated from.

### *Soils*

The Zlatograd land fill for municipal solid waste is situated mainly on the river terrace. A small part of the occupied territory—the slope next to the highway—used to be owned by the forestry before it was transferred to the land fill. The soils under and just next to the land fill are as follows: maroon-leached soils on the slope, and alluvial on the river terrace. The bedrock, respectively, consists of gneiss and river mantle. It is oriented towards south - south-east, and the elevation is 500 meters above sea level.

Soil tests were made to examine the pollution level of the terrain surrounding the land fill. Three test pits were examined, 2 of which at three depth levels (up to 70 centimeters) and one at 0 - 20 centimeters. The exact points from where test samples were taken are shown in Figure 2. The main physical, agrochemical and chemical features were determined. The mechanical composition data received shows that these are sandy-clay soils (Table 5). The samples are quite dynamic in their agrochemical components.

**Table 5**
**Mechanical Composition of the Soils (as a percentage of air dry condition)**

| Indicators | Particle size in millimeters | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample horizon and sum depth in centimeters | Sum | 1-025 | 0.25 | 0.05 | 0.01 | 0.005 | < 0.001 |
| | > 1 | | 0.05 | 0.01 | 0.005 | 0.001 | < 0.0 |
| Profile: N | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. 0-20 | 0 | 8.3 | 63.0 | 17.0 | 5.2 | 0.6 | 4.0 | 9.9 |
| 2. 20-40 | 15 | 39.5 | 27.1 | 12.4 | 3.6 | 3.0 | 3.1 | 9.8 |
| 3. 40-60 | 2 | 28.6 | 43.3 | 15.3 | 3.5 | 2.3 | 4.6 | 10.5 |
| 4. 0-15 | 15 | 40.7 | 13.8 | 12.3 | 6.6 | 5.8 | 4.7 | 17.2 |
| 5. 20-40 | 16 | 39.0 | 11.6 | 13.8 | 5.1 | 6.8 | 6.8 | 18.8 |
| 6. 40-70 | 17 | 37.1 | 15.8 | 12.5 | 5.0 | 3.8 | 8.5 | 17.3 |
| 7. 0-20 | 27 | 33.1 | 1.5 | 13.2 | 7.1 | 5.3 | 11.7 | 24.2 |

The soil reaction (data from the hydrogen index pH) (Table 6) changes from weakly acid (test pit 1) to very acid (test pit 2). Below 20 - 40 centimeters, acidity of the soil samples is higher in comparison with upper levels (pH is lower). The pH data and the mechanical composition of the sample taken from the farm land (test pit 3) show a slightly acid soil. That is why the land is suitable for cultivating crops which require a slightly acid soil, such as potatoes and rye.

**Table 6**
**General Content of Heavy Metals in Soils (Applicant: Zlatograd Landfill — Number of Tests: 5)**

| Test No. | Depth | pH in $H_2O$ | milligrams per 1000 grams | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Zn | Pb | Cu | Cd | Mn | Ni | Cr | Co |
| 1 | pit 0-20 | 6.58 | 300 | 170 | 34.5 | < 0.5 | 600 | 24.5 | 18.0 | 16.0 |
| 2 | pit 0-20 | 4.63 | 115 | 4520 | 15 | < 0.5 | 355 | 14.0 | 17.5 | 15.5 |
| 2 | pit 20-40 | 4.43 | 105 | 1275 | 14 | < 0.5 | 375 | 10.5 | 15.0 | 15.5 |
| 2 | pit 40-60 | 4.82 | 100 | 175 | 16.5 | < 0.5 | 375 | 12.0 | 16.0 | 17.5 |
| 3 | pit 0-10 | 5.38 | 105 | 24.5 | 18.0 | < 0.5 | 215 | 14.0 | 17.5 | 17.5 |

Laboratory Manager: (signed)
Research Associate Lilia Stanislavova

In the 40-60 centimeter layer of test pit 1, a very high concentration of mineral nitrogen was found—about 150 milligrams per 1000 grams of soil (Table 7). The total quantity of mineral nitrogen in the 0-60 centimeter layer in test pit 1 amounts to 100 kilograms per decare, which is extremely high. The probable cause for the high nitrogen concentration is that it comes from the surface flow from the farmed land situated on the river terraces over the land fill. In test pits 2 and 3, the concentration of mineral nitrogen was very low.

**Table 7**
**Chemical Properties of the Soil**

| Test No. | Depth | Humus % | milligrams per 100 grams | | | |
|---|---|---|---|---|---|---|
| | | | $P_2O_5$ | $K_2O$ | $NH_4$ | $NO_3$ |
| 1 | test pit 0-20 | 0.89 | 0.7 | 67.7 | 1.0 | 2.7 |
| | test pit 20-40 | 0.84 | 0.9 | 51.9 | 1.0 | 14.2 |
| | test pit 40-60 | 0.40 | 0.9 | 121.2 | 2.2 | 147.0 |
| 2 | test pit 0-15 | 1.22 | 13.4 | 25.4 | 3.5 | 0.05 |
| | test pit 20-40 | 0.74 | 3.8 | 20.0 | 0.7 | 5.0 |
| | test pit 40-40 | 0.68 | 10.9 | 20.0 | 1.5 | 5.7 |
| 3 | test pit 0-20 | 0.75 | 1.9 | 28.6 | 1.0 | 0.05 |

In test pits 1 and 3, the quantity of phosphates which can be assimilated by plants is very low, while in test pit 2 it does not exceed the average saturation (Table 7).

The concentration of mobile potassium in test pits 2 and 3 is within the proper limits. A considerable amount of potassium was found in test pit 1, for the same reasons which have caused the high concentration of mineral nitrogen (Table 7).

The soil samples were analyzed for heavy metals (Zn, Pb, Cu, Cd, Mn, Ni, Cr and Co) (Table 6). A very high concentration of lead was found for all three depths in test pit 2. It is 30 to 100 times above the acceptable limits and varies from 40 to 70 milligrams Pb per 1000 grams of soil, depending on the pH. The high concentration of lead is the result of the influence of the piled up wastes of unknown origin which have been dumped constantly over a period of 20 years, and also the result of disposed car batteries. An increased concentration of lead was also found in test pit 1, but there it is considerably lower than in test pit 2 because of the remoteness of the source of pollution. It exceeds the acceptable limit only 2.5 times.

In test pit 2, a certain increase in the concentration of zinc was found: 100 milligrams per 1000 grams of soil, while the allowed concentration limit is up to 60 milligrams per 1000 grams of soil for the respective pH. In test pit 3, no deviations of Zn and Pb concentrations for the respective pH were found. The concentration of other heavy (Cd, Ni, Cr, Co) and essential metals (Cu, Mn) are within normal limits.

Due to the considerable acidity of the soil, the above mentioned metals are in the form of ions or easily soluble substances. The latter determines their dissolution under the influence of rainfall or water filtered through the soil layers. When they reach the Varbitza, these heavy metals will cause considerable pollution of the river.

On the basis the physical, agrochemical and chemical analyses, the following general conclusions can be made regarding the samples tested:

Test pit 1: It is characterized by a light mechanical structure. There is a very high concentration of mineral nitrogen and mobile potassium in the 60 centimeter layer and a certain addition of zinc. The high concentration of mineral nitrogen poses an environmental risk, and is a prerequisite for nitrate pollution of the water.

Test pit 2: Characterized by a low pH. Agrochemical indicators are within the standard limits. Pollution by lead was observed, especially in the 0-40 centimeter layer. The zinc concentration is higher than the normal. This is a precondition for an environmental hazard, especially in case of a heavy flow.

Test pit 3: There is an acid reaction, low concentration of mineral nitrogen and assimilatable phosphates, and an average concentration of mobile potassium. Heavy metal concentration is within the standard. These soils can be used for farming after their nutritional conditions have been improved.

All three test pits were found to be poor in organic substance and have a low humus concentration (Table 7).

***Flora and Fauna: Protected Territories***

The MSW land fill in Zlatograd borders on natural plants and cultivated trees from the forest fund of the Forestry in Zlatograd. The wild vegetation is of a sprout origin, about 30-50 years old, and includes winter oak, cerris oak in varying proportions. The cultivated forest species, which are mainly the result of reconstruction, include coniferous trees, mainly white pines, and a scattering of some deciduous—winter oak, cerris oak, beech, horn beam. Along the riverbed, there are single alder trees and willows.

The above mentioned forest area falls into the special purpose category, since it is located in a water-supplying zone and because of its function to protect the river bank. According to the forest zoning, this forest fund land falls into the southern border region, Arda sub-region, lower flat-hilly and pre-mountainous region, the oak belt. (U-I-3) Analysis of the soil samples taken from three pits at the foot of the embankment (test pit 2) shows concentration of heavy metals and mineral nitrogen. It is not possible for these toxic substances to have a harmful effect on the forest areas for obvious reasons.

Smoke gases released as a result of the wastes burning in the land fill are not in harmful quantities. Forest plants in the area surrounding the land fill are in good condition and no damage was observed. Because of the steep angle on the slope (45-60°), the earth used for covering the waste practically slides down, and that is the reason for the absence of grass on the embankment. In the event that it is decided to build bank ramparts, it will become possible to pile up earth and keep it there. Regulation No. 26 on re-cultivation of damaged terrain, amelioration of low productive land, taking and preserving the humus layer, Article 3, paragraph 2 and Article 9, paragraph 2 requires a coverage layer of 2.15 meters (a minimum of 2 meters mix of horizons B and C, and 0.15 meters of humus) for afforestation, including planting bushes. These requirements can hardly be fulfilled, even if the angle of repose were to be changed and the steep of the slope lowered. A more reasonable decision would be to recultivate only by planting suitable drought-resistant grass species.

## ANALYSIS OF THE CORRESPONDENCES AND DEVIATIONS FROM THE NORMS: DEFINING POTENTIAL ENVIRONMENTAL AND HEALTH HAZARDS DUE TO THE OPERATION OF THE SITE

The land fill in Zlatograd is operated as a burning land fill. This reduces the quantity of leachate formed in the body of the land fill and reduces the concentration of organic and non-organic polluters and heavy metals in it. That is there is very little probability for heavy contamination of the river Varbitza which is in close proximity to the land fill. The self-purification ability of the river water reduces the potential risk of heavily polluted water entering the city's water supply system. However, the environmental impact discussed above will change its character, if the land fill is not operated as burning.

There is private property in close proximity to the land fill. This land, as well as the land on the upper terrace above the river, is used for agricultural production. There is a possibility of potential pollution of this area by the leachate from the land fill, or in the case dust from wastes is scattered during burning or by a strong wind. Also, hospital wastes pose a health hazard for the land fill and truck personnel, as well as for people working the farmland verging on the land fill (the private property is separated from it by a wire fence, about 1 meter high).

There is a serious health risk involved for all people around and on the land fill. Concentrated and even dispersed smoke contains toxic gases: carbon oxide (CO), hydrogen chloride, dioxin, and other products of in complete burning of fabrics, wood and organic wastes, and can seriously endanger human health. The garbage collectors are exposed to the gases only for short periods at a time, while the land fill guards and the agricultural workers on the nearby land can be seriously affected since they are exposed to the smoke and gases for more extended periods of time.

## MEASURES NECESSARY TO ADDRESS ECOLOGICAL PROBLEMS

### *Restrictive Parameters to Be Observed While Operating the Site*

The Zlatograd land fill was built and has been operated as an uncontrolled land fill. It was built on a natural terrain, without using natural insulators (e.g., natural clay and clay soils located under the wastes) or making any additional insulators (a clay, polymeric, or mixed shield). The possibility to operate the land fill as uncontrolled without a significant damage on the environment is due to the method of its operation as an almost constantly burning land fill.

It is not recommended that the land fill be operated in the same manner as controlled land fills, because it has been functioning for 24 years and the physical restrictions of the area do not allow for constant packing and covering with soil. There is no possibility whatsoever for restricting the quantity of leachate from the land fill or its degree of pollution. Since the existing land fill does not have any insulation or a leachate control and draining system, to operate it as a controlled land fill will cause even greater environmental pollution in general and of the Varbitza river in particular. For that reason it would be more advisable to continue to operate it as before, as a burning land fill. On the other hand, this will be possible only for a restricted period of time, until a new site for a sanitary land fill is selected, and the facility designed and built. It should be stressed, however, that the burning land fill would continue to pollute the air.

### *Recommendations for Improvements in Environmental Control*

For the purposes of environmental management and the reduction of environmental hazards resulting from the temporary operation of the existing land fill in Zlatograd as uncontrolled, the following measures are recommended:

- To develop and implement immediately a system of waste content management, by separating and removing all plastic wastes.

- To develop a project for separating and labeling all medical wastes generated by hospitals, clinics, and private practices. Hazardous wastes must be buried in the carcass pit for dead animals.

- To implement an educational program explaining the harmful impact of the land fill smoke. The program should address waste-collecting personnel as well as agricultural workers on the fields.

- To speed up the project for developing a new land fill.

- As soon as possible to close the existing land fill and to develop a plan on how to seal and recultivate it.

In order to stabilize the land fill in sections endangered by the undermining processes, landslide areas, and to prepare for its conservation and recapitulation, it is necessary to do the following:

- To build a protective bank-strengthening structure in the front part of the land fill (facing the city), which will protect the repose of construction and residential wastes from the direct influence of the river stream.

- To restructure the so formed angles of repose by reducing their steepness and by building embankments to stabilize them. To restrict lye-precipitation, it will be necessary to build pillars at the foot of the repose.

- To make a layer of soil, and perform technical and biological recultivation of the land fill.

### *Measures for Monitoring and Control of Pollution*

Since the existing land fill in Zlatograd will continue to be operated as before, it is necessary to plan a monitoring system to prevent its harmful impact on human health and the surrounding environment. The monitoring system should include:

— Periodic control of the water quality of the Varbitza river before and after the land fill and in the zone of the water supplying wells;
— Control over the burning processes on the land fill to ensure full incineration of the wastes;

— Control over the composition of wastes stored in the land fill, not allowing the disposal plastic bottles;
— Labeling of hazardous medical wastes and burying them in the carcass pit; and
— Periodic observation of the land fill base to spot leachate outflow points.

**CONCLUSIONS**

The existing municipal land fill in Zlatograd poses a real danger for the environment, human health and safety. The risk of uncontrolled impact on the environment is reduced by operating the land fill as burning. The harmful impact affects most significantly the ambient air. The storage capacity of the land fill is nearly exhausted. In discussions with the municipal sanitation officer and making the decision to continue temporarily to operate the land fill as a burning one, it was established that it can be used only for another 2 or 3 years.

Presently, the municipality of Zlatograd has not come to a decision about the location of the new sanitary land fill. For that reason the expert team agrees that the existing land fill can be used "temporarily". It is absolutely necessary that during this "temporary" operation all recommendations made in the EIA report be taken into consideration. Environmental control should be performed and immediate measures should be taken for introducing a monitoring system, and the land fill should be closed, sealed and recultivated as soon as possible.

SIGNED: E. Kostakeva, Assistant Professor, Engineer
LEADER of LICENSED EXPERTS TEAM

LICENSED EXPERTS:
— M. Radenkova-Ianeva, Associate Professor, D. Sc., chemistry engineer
— Anna Peeva, forestry engineer
— Peter Georgiev, Senior Research Associate, 2nd degree, D. Sc., engineer

## ANNEX 1

## OFFICIALS CONTACTED

— Nikolai Vassilev Despotov, Mayor, Municipality of Zlatograd
— Minka Kehaiova, Manager, Sanitation Department, Municipality of Zlatograd
— Georgi Stoyankov, Director, Forestry Enterprise
— Minka Arabova, Chief Engineer, Municipality of Zlatograd
— Yordan V. Tzenov, Head of Labor and Manpower Dept., Municipality of Zlatograd
— Dinyo Chelov, Chief Specialist, Agriculture, Forests and Water Dept., Municipality of Zlatograd
— Vesselin Yurchiev, Head of Land Property Commission, Zlatograd
— Emil Suftev, Manager, Water Supply and Sewerage Co.

## ANNEX 2

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## ANNEX 3

## STATEMENTS OF LICENCED EXPERTS

### STATEMENT

I hereby certify that I meet the requirements for an independent expert according to the Environmental Protection Act and hold License No. 025/April 25,1996, issued by the Ministry of the Environment.

Declarer undersigned: Dr. Emilia Hristova Kostakeva.

— Passport: B, No. 0394764 issued by RPD Botev in Sofia on January 21, 1983
— PIN: 4501136954
— Residence: Sofia, "Mladost 2", Block 235, Entrance A
— Place of employment: University of Architecture, Construction and Geodesy in Sofia, Department of Water Supply, Sewerage and Water Treatment.
— Telephone: 63321/580

Sofia, March 1997

Signed: Ass. Prof., Eng. E. Kostakeva

### STATEMENT

I hereby certify that I meet the requirements for an independent expert according to the Environmental Protection Act and hold License No. 015/April 25,1996, issued by the Ministry of the Environment.

Declarer undersigned: Dr. Magdelinka Zlatkova Radenkova - Ianeva, associated professor, chemistry engineer.

— Passport: B, No. 0072038 issued by RPD No. 4 in Sofia on January 27, 1982
— PIN: 4009226697
— Residence: Sofia, Lui Aier St., Block of flats No. 254, Entrance 7
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Sofia, March 1997

Signed: Ass. Prof., Chem. Eng. M. Radenkova-Ianeva

**STATEMENT**

I hereby certify that I meet the requirements for an independent expert according to the Environmental Protection Act and hold License No. 030/April 25,1996, issued by the Ministry of the Environment.

Declarer undersigned: Anna Naneva Peeva

— Passport: B, No. 1367016 issued by RPD No. 1 in Sofia on December 02, 1993
— PIN: 3007236713
— Residence: Sofia, 2 Skobelev Blvd., Municipality of Triaditza
— Place of employment: Retired
— Telephone: 526881

Sofia, March 1997

Signed: A. Peeva

**STATEMENT**

I hereby certify that I meet the requirements for an independent expert according to the Environmental Protection Act and hold License No. 012/April 25,1996, issued by the Ministry of the Environment.

Declarer undersigned: Dr. Eng. Peter Georgiev Petrov, senior research associate of grade 2

— Passport: B, No. 0761567 issued by RPD No. 5 in Sofia on November 22, 1984
— PIN: 3304266865
— Residence: Sofia, 30 Russali St., Municipality of Oborishte
— Place of employment: Retired
— Telephone: 431149

Sofia, March 1997

Signed: Senior Research Associate, D. Sc., Eng. P. Petrov